HP LP2480zx LCD Monitor
User Guide

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About This Guide

This guide provides information on setting up the monitor, installing drivers, using the on-screen display menu, troubleshooting and technical specifications.

⚠ **WARNING!** Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.

△ **CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

NOTE: Text set off in this manner provides important supplemental information.

Table of contents

1 Product Features

HP LP2480zx Model 1

2 Safety and Maintenance Guidelines

Important Safety Information 4
Maintenance Guidelines 5
Cleaning the Monitor 6
Shipping the Monitor 6

3 Setting Up the Monitor

Installing the Monitor Pedestal Base 7
Rear Components 8
Selecting and Connecting the Signal Cables 9
Cable Management 10
Connecting the Monitor Power 11
Connecting USB Devices 12
Adjusting the Monitor 12
Turning on the Monitor 14
Using the Accessory Rails 15
Removing the Monitor Pedestal Base 15
Mounting the Monitor 16
Locating the Rating Labels 18

4 Operating the Monitor

Software and Utilities 19
The Information File 19
The Image Color Matching File 19
Installing the .INF and .ICM Files 20
Installing from the CD 20
Downloading from the Worldwide Web 20
Using the Auto-Adjustment Function 21
Front Panel Controls 22
Adjusting the Monitor Settings 23
Using the On-Screen Display Menu 23
OSD Menu Selections 24
Optimizing Digital Conversion 28
Using the HP Display Assistant Software 28
Identifying Monitor Conditions 29

Sleep Timer Mode 30
Recommended Options 31

Appendix A Advanced Color Management Features and Usage

Color Gamut and Color Space Coverage 33
Color Space Emulation 34
Theory of Operation 34
Summary of Color Space Selection Availability 37
10 bits/color LCD Module 38
LED Backlight Unit 38
Transfer Function (Gamma) 39

Appendix B Troubleshooting

Solving Common Problems 42
Using the Worldwide Web 43
Preparing to Call Technical Support 43

Appendix C Technical Specifications

HP LP2480zx Model 44
Recognizing Preset Display Resolutions 46
Entering User Modes 47
Energy Saver Feature 47

Appendix D Agency Regulatory Notices

Federal Communications Commission Notice 48
Modifications 48
Cables 48
Declaration of Conformity for Products Marked with the FCC Logo (United States Only) 48
Canadian Notice 49
Avis Canadien 49
European Union Regulatory Notice 49
German Ergonomics Notice 50
Japanese Notice 50
Korean Notice 50
Power Cord Set Requirements 50
Japanese Power Cord Requirements 50
Product Environmental Notices 51
Materials Disposal 51
Disposal of Waste Equipment by Users in Private Household in the European Union 51
Chemical Substances 51
Restriction of Hazardous Substances (RoHS) 51

Appendix E LCD Monitor Quality and Pixel Policy

1 Product Features

HP LP2480zx Model

The LCD (liquid crystal display) monitor has an active matrix, thin-film transistor (TFT) panel. The monitor features include:

- RGB LED backlight for wider color gamut support, better color and luminance uniformity on the screen, and better color and luminance stability
- Wide 105% NTSC color gamut to enable accurate color gamut remapping for Adobe-RGB and sRGB
- IPS 61 cm (24-inch)1920 x 1200 panel for the best available LCD panel color performance
- True 10-bit panel to increase supported colors from 16.7 million (8-bit) to 1.07 billion colors and reduce color banding
- Panel support for refresh rates of 48Hz, 50Hz, and 60Hz to enable video with these refresh rates to be displayed without frame rate conversion and the artifacts this process causes
- Ability to accurately remap the color gamut of the monitor (within the supported color gamut of the panel) to enable the selection of the color space and very accurately set the RGB primaries for consistent and repeatable colors
- Adjustable white point of 4K to 12K using the LED backlight (no loss of dynamic range) to provide maximum flexibility
- Adjustable gamma of 1.0 to 3.0 with a step size of 0.1 to provide maximum flexibility
- Adjustable luminance of 50 to 250 cd/m^2 with a wide adjustment range for maximum flexibility in a working environment and ability to adjust down to very low luminance levels (50 cd/m^2)
- Very high color and luminance stability (with typical use) and calibration only needed every 1000 hours, which means the monitor will not require frequent calibrations
- Ability to set up color space presets and choose the RGB primaries, luminance, gamma, and white point to allow you to quickly switch between different monitor color settings
- Calibrated color space factory presets for Adobe-RGB, Rec. 709, sRGB, SMPTE-C, and DCI-P3 Emulation so the monitor is ready to use for color critical applications with minimal setup
- Typical 100% Adobe-RGB coverage for very accurate support of this common color space
- Option to return to Factory Calibration settings to easily restore the monitor to the factory settings
- Option to easily return to last User Calibration settings in case the new calibration was not successful

- OSD warning and reminder messages when the monitor needs to be recalibrated
- All controls supported over DDC/CI and USB for maximum flexibility and support for both Windows and Linux
- Updatable 12-bit pre-LUT, 3x3 matrix, and post-LUT for maximum flexibility
- HP Display Assistant software (Windows) to support easy set up of the monitor
- HP Display Assistant software support for Asset Management to help IT managers and Theft Deterrence to help reduce unauthorized relocation of the monitor
- Updatable monitor firmware to enable HP to quickly and easily provide solutions to identified problems and provide custom solutions
- Front bezel Function button to quickly select the most commonly used operation
- PIP functionality to enable the Component, S-video, and Composite inputs to be viewed in a small secondary window or side-by-side on the main window
- Easy to use PIP control through HP Display Assistant software
- DVI-I (analog and single link digital), DisplayPort 1.1, HDMI 1.3, Component, S-video, and Composite inputs for support of a wide range of video inputs
- Video cables provided: DVI-I to DVI-D, DVI-I to VGA, DisplayPort, and HDMI
- True 10-bit monitor with full 10-bit support from the monitor DisplayPort 1.1 and HDMI 1.3 inputs through the panel for support of 1.07 B colors
- HDCP copy protection support on DVI (digital), DisplayPort, and HDMI inputs to enable the display of protected content
- Support for 2048 x 1200 and 2048 x 1080 modes (using cropping) to support commonly used resolutions used by animation studios
- Backlight bezel buttons and OSD button labels to help make working with the monitor in a dark environment easy
- USB 2.0 4-port hub with the connectors on the side for easy access to USB connections
- USB cable included to connect the monitor's USB hub to the USB connector on the computer
- Height adjustment, tilt, and swivel for support of the best ergonomic setup of the monitor
- Integrated sensor for support of auto-pivot with HP Display Assistant software so that when the display panel is rotated, the video automatically switches to portrait mode
- Wide viewing angle to allow viewing from a sitting or standing position, or moving side-to-side
- Removable pedestal base for flexible mounting solutions with HP Quick Release and VESA 100 mm mounting holes
- Accessory rail on monitor to accept optional mounted devices, such as an HP speaker bar
- Plug and play capability if supported by the system.
- Security slot provision on rear of monitor for optional cable lock
- Cable management feature for placement of cables and cords

- On-Screen Display (OSD) adjustments in several languages for ease of setup and screen optimization
- Software and documentation CD that includes HP Display Assistant software, monitor driver software, and product documentation
- Energy saver feature to meet requirements for reduced power consumption
- Compliant with the following regulated specifications:
  - European Union CE Directives
  - Swedish MPR II 1990
  - Swedish TCO Requirements

2 Safety and Maintenance Guidelines

Important Safety Information

A power cord is included with the monitor. If another cord is used, use only a power source and connection appropriate for this monitor. For information on the correct power cord set to use with the monitor, refer to the Power Cord Set Requirements on page 50 in Appendix C.

⚠ **WARNING!** To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding feature. The grounding plug is an important safety feature.
- Plug the power cord in a grounded (earthed) outlet that is easily accessible at all times.
- Disconnect power from the product by unplugging the power cord from the electrical outlet.

For your safety, do not place anything on power cords or cables. Arrange them so that no one may accidentally step on or trip over them. Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the cord by the plug.

To reduce the risk of serious injury, read the *Safety and Comfort Guide*. It describes proper workstation, setup, posture, and health and work habits for computer users, and provides important electrical and mechanical safety information. This guide is located on the Web at http://www.hp.com/ergo and/or on the documentation CD, if one is included with the monitor.

△ **CAUTION:** For the protection of the monitor, as well as the computer, connect all power cords for the computer and its peripheral devices (such as a monitor, printer, scanner) to some form of surge protection device such as a power strip or Uninterruptible Power Supply (UPS). Not all power strips provide surge protection; the power strips must be specifically labeled as having this ability. Use a power strip whose manufacturer offers a Damage Replacement Policy so you can replace the equipment, if surge protection fails.

Use the appropriate and correctly sized furniture designed to properly support your HP LCD monitor.

⚠ **WARNING!** If an LCD monitor is not positioned in a sufficiently stable location, it can be potentially hazardous due to falling. Many injuries, particularly to children, can be avoided by taking simple precautions such as:

• Using cabinets or stands recommended by the manufacturer of the LCD monitor.

• Only using furniture that can safely support the LCD monitor.

• Ensuring the LCD monitor is not overhanging the edge of the supporting furniture.

• Not placing the LCD monitor on tall furniture (for example, cupboards or bookcases) without anchoring both the furniture and the LCD monitor to a suitable support.

• Not standing the LCD monitor on cloth or other materials placed between the LCD monitor and supporting furniture.

• Educating children about the dangers of climbing on furniture to reach the LCD monitor or its controls.

Maintenance Guidelines

To enhance the performance and extend the life of the monitor:

- Do not open the monitor cabinet or attempt to service this product yourself. Adjust only those controls that are covered in the operating instructions. If the monitor is not operating properly or has been dropped or damaged, contact an authorized HP dealer, reseller, or service provider.
- Use only a power source and connection appropriate for this monitor, as indicated on the label/back plate of the monitor.
- Be sure the total ampere rating of the products connected to the outlet does not exceed the current rating of the electrical outlet, and the total ampere rating of the products connected to the cord does not exceed the rating of the cord. Look on the power label to determine the ampere rating (AMPS or A) for each device.
- Install the monitor near an outlet that you can easily reach. Disconnect the monitor by grasping the plug firmly and pulling it from the outlet. Never disconnect the monitor by pulling the cord.
- Turn the monitor off when not in use. You can substantially increase the life expectancy of the monitor by using a screen saver program and turning off the monitor when not in use.
- Slots and openings in the cabinet are provided for ventilation. These openings must not be blocked or covered. Never push objects of any kind into cabinet slots or other openings.
- Do not drop the monitor or place it on an unstable surface.
- Do not allow anything to rest on the power cord. Do not walk on the cord.
- Keep the monitor in a well-ventilated area, away from excessive light, heat or moisture.
- When removing the monitor base, you must lay the monitor face down on a soft area to prevent it from getting scratched, defaced, or broken.

Cleaning the Monitor

1. Turn off the monitor and the computer.
2. Unplug the monitor from the wall outlet.
3. Clean the monitor plastics with a clean cloth dampened with water.
4. Clean the monitor screen with an antistatic screen cleaner.

△ **CAUTION:** Do not use benzene, thinner, ammonia, or any other volatile substances to clean the monitor or the screen. These chemicals may damage the cabinet finish as well as the screen.

Shipping the Monitor

Keep the original packing box in a storage area. You may need it later if you move or ship the monitor.

3 Setting Up the Monitor

To set up the monitor, ensure that the power is turned off to the monitor, computer system, and other attached devices, then follow the instructions below.

NOTE: Be sure the master power switch, located on the rear panel of the monitor, is in the off position. The master power switch turns off all power to the monitor.

CAUTION: For proper ventilation, the monitor must have a minimum of 5 cm (2 inches) of clearance around all sides and the cooling fan below the handle must not be blocked.

Installing the Monitor Pedestal Base

NOTE: Do not install the pedestal base if the monitor will be used on a wall, swing arm, or other mounting fixture; instead see Mounting the Monitor on page 16 in this chapter.

1. Using both hands, position the monitor over the pedestal base.

   CAUTION: Do not touch the surface of the LCD panel. Pressure on the panel may cause non-uniformity of color or disorientation of the liquid crystals. If this occurs the screen will not recover to its normal condition.

2. Press down firmly on the monitor to lock the pedestal base in place. When the base locks, it will make a clicking sound.

Figure 3-1 Inserting the Monitor into the Pedestal Base

NOTE: Be sure the pedestal base is securely locked before continuing with the setup.

Rear Components

Figure 3-2 Rear Components

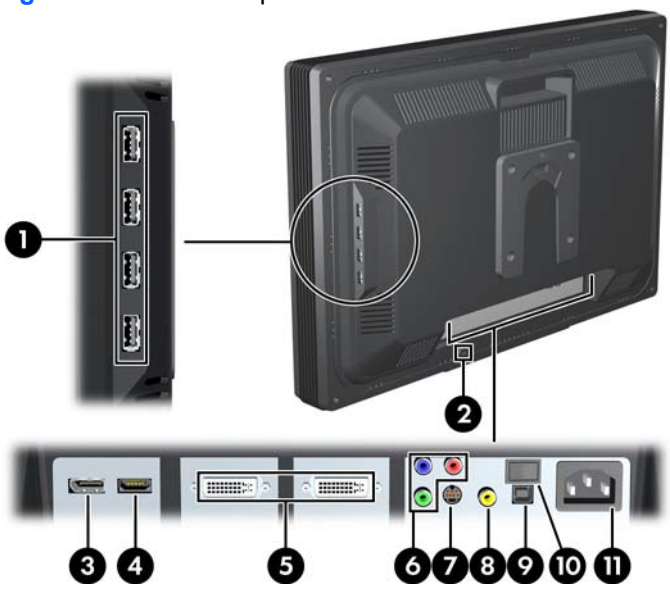


Table 3-1 HP LP2480zx Rear Components

Component		Function
1	USB Downstream Connectors (side panel)	Connects optional USB devices to the monitor.
2	Cable Lock Provision	Provides slot for use with cable security locks.
3	DisplayPort Connector	Connects the DisplayPort signal cable to the monitor.
4	HDMI Connector	Connects the HDMI signal cable to the monitor.
5	DVI-I Connectors	Connects the DVI-I to VGA signal cable or DVI-I to DVI-D signal cable to the monitor.
6	Component Connectors	Connects Component signal cables to the monitor.
7	S-Video Connector	Connects an S-Video signal cable to the monitor.
8	Composite Connector	Connects a Composite signal cable to the monitor.
9	USB Upstream Connector	Connects the monitor USB hub to a host USB port/hub.
10	Master Power Switch	Turns off all power to the monitor.
11	AC Power Connector	Connects the AC power cord to the monitor.

Selecting and Connecting the Signal Cables

The monitor features two DVI-I connectors capable of supporting either analog or digital input, one DisplayPort connector, one HDMI connector, one set of Component connectors, one S-Video connector, and one Composite connector.

The monitor will automatically select an active signal on the DVI, HDMI, and DisplayPort inputs. The Component, S-Video, and Composite inputs must be selected manually. The inputs can be selected through the On-Screen Display (OSD) feature by pressing the Input button on the front panel.

NOTE: Refer to Rear Components on page 8 for signal input connector locations.

Table 3-2 Signal Connectors and Cables

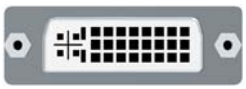
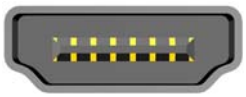
Input	Monitor Connector and Cable Plug	Connection Description
DVI-I	 	The video mode supported by the DVI-I connectors are determined by the video cable used. • For digital operation, use the DVI-I to DVI-D signal cable provided. Connect the DVI-I to DVI-D signal cable to the DVI-I connector on the monitor and the other end to the DVI-D connector on the computer. • For analog operation, use the DVI-I to VGA signal cable provided. Connect the DVI-I to VGA signal cable to a DVI-I connector on the monitor and the other end to the VGA connector on the computer.
DisplayPort	 	Connect the DisplayPort cable provided to the DisplayPort connector on the monitor and the DisplayPort connector on the computer for digital operation. **NOTE:** The DisplayPort cable locks in place when it is connected. To remove a DisplayPort cable, press the button on top of the cable end and pull the cable end from the connector.
HDMI	 	Connect the HDMI cable provided to the HDMI connector on the monitor and the HDMI connector on the input device for digital operation.
Component (Y Pb Pr)	 	Connect a set of Component cables to the Component connectors on the monitor and the Component connectors on the input device for analog operation. Cable set purchased separately.

Table 3-2 Signal Connectors and Cables (continued)

Input	Monitor Connector and Cable Plug	Connection Description
S-Video		Connect an S-Video cable to the S-Video connector on the monitor and the S-Video connector on the input device for analog operation. Cable purchased separately.
Composite		Connect a Composite cable to the Composite connector on the monitor and the Composite connector on the input device for analog operation. Cable purchased separately.

Cable Management

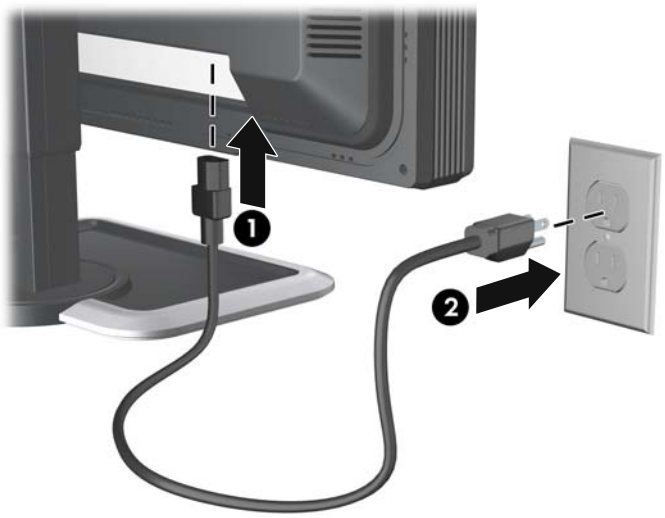
Before connecting the cables, route them through the opening on the neck of the monitor's pedestal.

Figure 3-3 Using the Cable Management Feature

Connecting the Monitor Power

1. Place the monitor in a convenient, well-ventilated location near the computer.
2. Connect one end of the power cable to the AC power connector on the back of the monitor (1), and the other end to an electrical wall outlet (2).

Figure 3-4 Connecting the Power Cable



⚠ **WARNING!** To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Disconnect power from the equipment by unplugging the power cord from the electrical outlet.

For your safety, do not place anything on power cords or cables. Arrange them so that no one may accidentally step on or trip over them. Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the cord by the plug.

Connecting USB Devices

The monitor provides four USB connectors on the side panel that can be used to connect devices such as a digital camera, USB keyboard, or USB mouse.

1. Connect one end of the USB hub cable to the USB connector on the rear panel of the computer, and the other end to the upstream USB connector on the monitor.
2. Connect the USB devices to the USB downstream connectors on the side panel of the monitor.

Figure 3-5 Connecting USB Devices

Adjusting the Monitor

1. Tilt the monitor's panel forward or backward to set it to a comfortable eye level.

Figure 3-6 Tilting the Monitor

2. Swivel the monitor to the left or right for the best viewing angle.

Figure 3-7 Swiveling the Monitor

3. Adjust the monitor's height so that it is parallel to your eye height for a comfortable viewing position.

⚠ **WARNING!** A lock-down/release button on the front of the column prevents the display panel from sliding up when the monitor is lifted. If the display panel is locked in the lowest height position:

a. Make sure that the monitor is safely positioned on a stable surface.

b. Gently push down on the display panel.

c. While pushing down the display panel, press the lock-down/release button on the front of the column.

d. Guide the display panel up to the desired height.

Figure 3-8 Adjusting the Height

4. Pivot the monitor clockwise from landscape to portrait orientation viewing to adapt to your application.

△ **CAUTION:** USB cables that are connected to the monitor can be damaged if they come in contact with the desk or table top surface when rotating the display panel to the portrait position. Ensure that there is enough clearance for the USB cables as you rotate the monitor.

Be sure to remove any cables from the cable management opening before pivoting the monitor.

Figure 3-9 Pivoting the Monitor

NOTE: To view information on the screen in portrait mode, you will need to install the HP Display Assistant software included on the software and documentation CD. The position of the OSD menu can also be rotated to portrait mode. To rotate the OSD menu, press the Menu button on the monitor's front panel, then select **OSD Control** > **OSD Rotation**.

△ **CAUTION:** Monitor display panel orientations of 180 and 270 degrees are not supported and may result in damage to the monitor.

Turning on the Monitor

1. Press the power switch to turn on the computer.
2. Verify the master power switch on the rear of the monitor is in the on (I) position.
3. Press the power button on the front of the monitor.

△ **CAUTION:** Burn-in image damage may occur on monitors that display the same static image on screen for a prolonged period of time.* To avoid burn-in image damage on the monitor screen, you should always activate a screen saver application or turn off the monitor when it is not in use for a prolonged period of time. Image retention is a condition that may occur on all LCD screens.

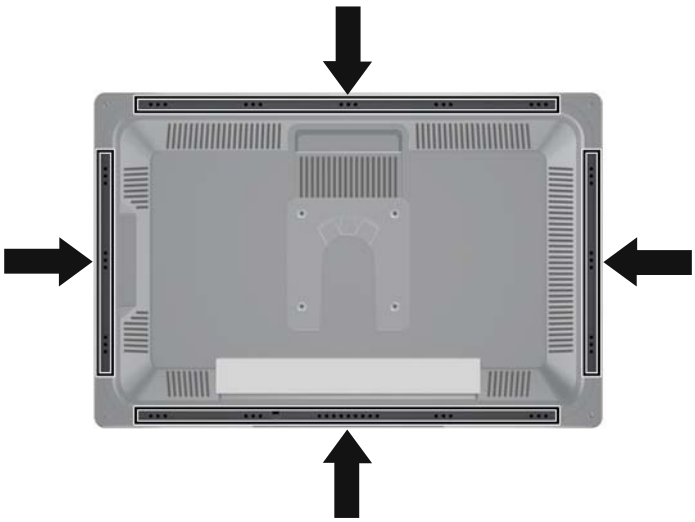
* A prolonged period of time is 12 consecutive hours of non-use.

NOTE: After turning on the monitor, a minimum 30 minute warm-up time is required for best performance.

Using the Accessory Rails

The monitor features accessory rails on the rear that may be used to mount optional devices, such as the HP speaker bar, to the LCD monitor. Refer to the documentation included with the optional device for detailed mounting instructions.

Figure 3-10 Using the Accessory Rails Feature



Removing the Monitor Pedestal Base

You can remove the monitor panel from the pedestal base to mount the panel on a wall, a swing arm, or other mounting fixture.

This monitor has a Quick Release mechanism that allows you to easily remove and replace the monitor panel to the pedestal base.

△ **CAUTION:** Before beginning to disassemble the monitor, be sure the monitor is turned off and the power and signal cables are both disconnected. Also disconnect any USB cables that are connected to the monitor.

1. Disconnect and remove the signal and power cables from the back of the monitor.
2. Slide the quick release latch **(1)** on the pedestal base to the side (either right or left).

3. Pull up on the monitor display panel **(2)** to remove it from the base.

Figure 3-11 Removing the Monitor from the Pedestal Base

Mounting the Monitor

The HP Quick Release can be removed from the pedestal base and installed on a mounting fixture. It allows you to quickly and securely attach the monitor panel to the mounting fixture.

1. Remove the monitor panel from the pedestal base. Refer to Removing the Monitor Pedestal Base on page 15 in the previous section.

△ **CAUTION:** This monitor supports the VESA industry standard 100 mm mounting holes. To attach a third-party mounting solution to the monitor, four 4 mm, 0.7 pitch, and 10 mm long screws are required (not provided with the monitor). Longer screws must not be used because they may damage the monitor. It is important to verify that the manufacturer's mounting solution is compliant with the VESA standard and is rated to support the weight of the monitor display panel. For best performance, it is important to use the power and video cables provided with the monitor.

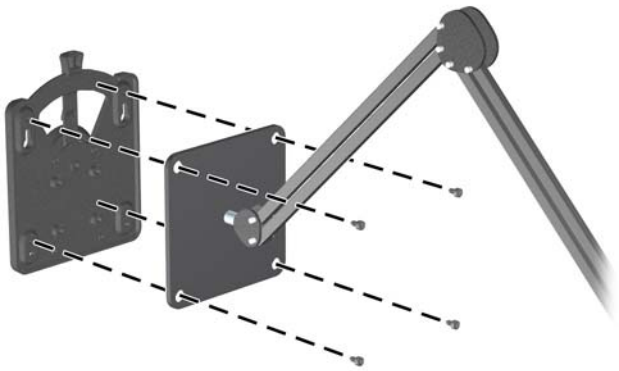
⚠ **WARNING!** To reduce the risk of personal injury or of damage to the equipment, check that the wall-mounting fixture is adequately installed and secured before attaching the monitor. Refer to the instructions supplied with the wall-mounting fixture and check that it is capable of supporting the monitor.

2. Remove the Quick Release from the pedestal base by removing the four screws.

Figure 3-12 Removing the HP Quick Release from the Pedestal Base

3. Mount the Quick Release to a swing arm or other mounting fixture using the four screws removed from the Quick Release in the previous step.

Figure 3-13 Installing the Quick Release



△ **CAUTION:** The Quick Release can also be installed directly to a wall to mount the monitor panel. It is designed to support a maximum of up to 10.9 kg (24 lbs). If you are mounting to a wall, HP recommends that you consult with a qualified engineering, architectural, or construction professional to determine the appropriate type and quantity of mounting fasteners required for your application and to ensure that the mounting solution is properly installed to support applied loads.

4. Insert the monitor panel into the Quick Release, and then press down firmly on the monitor to lock it in place. When the Quick Release locks, it will make a clicking sound.

Figure 3-14 Inserting the Monitor Panel into the Quick Release

Locating the Rating Labels

The rating labels on the monitor provide the spare part number, product number, and serial number. You may need these numbers when contacting HP about the monitor model. The rating labels are located on the rear of the monitor display panel.

Figure 3-15 Locating the Rating Labels

4 Operating the Monitor

Software and Utilities

The CD that comes with the monitor contains files you can install on the computer:

- an .INF (Information) file
- .ICM (Image Color Matching) files
- auto-adjustment pattern utility
- HP Display Assistant software

PDF Complete is supplied on this CD and can be installed from the menu.

NOTE: If the monitor does not include a CD, the .INF and .ICM files can be downloaded from the HP monitors support Web site. See Downloading from the Worldwide Web on page 20 in this chapter.

The Information File

The .INF file defines monitor resources used by Microsoft Windows operating systems to ensure monitor compatibility with the computer's graphics adapter.

This monitor is Microsoft Windows Plug and Play compatible and the monitor will work correctly without installing the .INF file. Monitor Plug and Play compatibility requires that the computer's graphic card is VESA DDC2–compliant and that the monitor connects directly to the graphics card. Plug and Play does not work through separate BNC type connectors or through distribution buffers/boxes.

The Image Color Matching File

The .ICM files are data files that are used in conjunction with graphics programs to provide consistent color matching from monitor screen to printer, or from scanner to monitor screen. The .ICM file contains a monitor color system profile. This file is activated from within graphics programs that support this feature.

NOTE: The ICM color profile is written in accordance with the International Color Consortium (ICC) Profile Format specification.

Installing the .INF and .ICM Files

After you determine that you need to update, you can install the .INF and .ICM files from the CD or download them.

Installing from the CD

To install the .INF and .ICM files on the computer from the CD:

1. Insert the CD in the computer CD-ROM drive. The CD menu is displayed.
2. View the **Monitor Driver Software Readme** file.
3. Select **Install Monitor Driver Software**.
4. Follow the on-screen instructions.
5. Ensure that the proper resolution and refresh rates appear in the Windows Display control panel.

NOTE: You may need to install the digitally signed monitor .INF and .ICM files manually from the CD in the event of an installation error. Refer to the Monitor Driver Software Readme file on the CD.

Downloading from the Worldwide Web

To download the latest version of .INF and .ICM files from the HP monitors support Web site:

1. Refer to http://www.hp.com/support and select the country region.
2. Follow the links for the monitor to the support page and download page.
3. Ensure the system meets the requirements.
4. Download the software by following the instructions.

Using the Auto-Adjustment Function

You can optimize the screen performance for VGA (analog) input by using the **- (Minus)** button on the monitor and the auto-adjustment pattern software utility on the CD provided.

Do not use this procedure if the monitor is using a DVI-D, HDMI, or DisplayPort input. If the monitor is using a VGA (analog) input, this procedure can correct the following image quality conditions:

- Fuzzy or unclear focus
- Ghosting, streaking or shadowing effects
- Faint vertical bars
- Thin, horizontal scrolling lines
- An off-center picture

To use the auto-adjustment feature:

1. Allow the monitor to warm up for 20 minutes before adjusting.
2. Press the - (minus) button on the monitor front panel.
    - You can also press the Menu button, then select **Image Control** > **Auto Adjustment** from the OSD Main Menu. Refer to Adjusting the Monitor Settings on page 23 in this chapter.
    - If the result is not satisfactory, continue with the procedure.
3. Insert the CD in the disc drive. The CD menu is displayed.
4. Select **Open Auto-Adjustment Software**. The setup test pattern is displayed.
5. Press the - (minus) button on the monitor front panel to produce a stable, centered image.
6. Press the ESC key or any other key on the keyboard to exit the test pattern.

Front Panel Controls

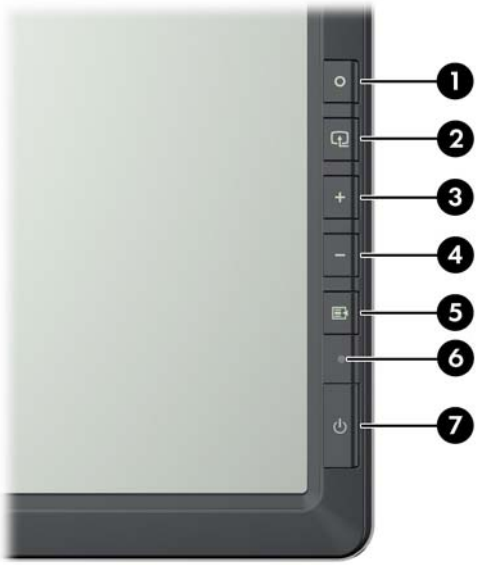


Table 4-1 Monitor Front Panel Controls

Control		Function
1	Function	Performs the function set in the OSD menu (OSD Control > Function Control).
2	Input	Selects the video input (DVI-1, DVI-2, HDMI, DisplayPort, Component, S-Video, or Composite).
3	+ (Plus)	Navigates forward through the OSD menu and increases adjustment levels.
4	– (Minus)	• Navigates backward through the OSD menu and decreases adjustment levels. • When the OSD menu is inactive, activates the auto adjustment feature to optimize the screen image.
5	Menu/Select	Opens, selects or exits the OSD menu.
6	Power LED	Green = Fully powered. Amber = Sleep mode. Flashing Amber = Sleep Timer mode.
7	Power	Turns the monitor on or off.

Adjusting the Monitor Settings

The monitor settings can be adjusted from the On-Screen Display (OSD) menu or from the HP Display Assistant software.

NOTE: If you are having a problem with the monitor settings, select the Factory Reset option in the OSD menu to see if that solves the problem before adjusting other settings in the OSD menu. The Factory Reset function returns all OSD menu settings and DDC/CI controls to the factory default settings, except the language.

Using the On-Screen Display Menu

Use the On-Screen Display (OSD) to adjust the screen image based on your viewing preferences. To access the OSD, do the following:

1. If the monitor is not already on, press the Power button to turn on the monitor.
2. To access the OSD Menu, press the Menu button on the monitor's front panel.

3. To navigate through the OSD Menu, press the + (plus) button on the monitor's front panel to scroll down, or the – (minus) button to scroll up.
4. To select an item from the OSD Menu, use the + or – buttons to scroll to and highlight your selection, then press the Menu button to select that function.
5. Adjust the item using the + or – buttons on the front panel to adjust the scale.
6. After adjusting the function, select **Save and Return**, or **Cancel** if you don't want to save the setting, then select **Exit** from the Main Menu.

NOTE: If the front panel buttons remain untouched for 40 seconds while displaying a menu, the OSD will automatically "time out" and close, and all adjustments made in the OSD will be saved. The factory default 40 second delay can be adjusted in the OSD to between 10 and 60 seconds.

OSD Menu Selections

The following table lists the On-Screen Display (OSD) menu selections and their functional descriptions. After changing an OSD menu item, and if the menu screen has these options, you may choose to:

- **Cancel**—to return to the previous menu level.
- **Save and Return**—to save all changes and return to the OSD Main Menu screen. This Save and Return option is only active if you change a menu item.
- **Reset**—to change back to the previous setting.

Table 4-2 OSD Menu

Icon	Main Menu	Submenu	Description
	Color Space		Displays the Color Space presets. For each Color Space preset, the RGB primaries, WhitePoint, Gamma, and Luminance are listed. Presets set up at the factory can be reset to factory calibration. Presets set up by the user can be reset to the last calibration.
		Full	Factory-calibrated preset with the full color gamut and native white point supported by the panel/backlight.
		Adobe-RGB	Factory calibrated preset for the Adobe-RGB standard.
		SMPTE-C	Factory calibrated preset for the SMPTE-C standard.
		sRGB	Factory calibrated preset for the sRGB standard.
		Rec. 709	Factory calibrated preset for the Rec. 709 standard.
		DCI-P3 Emulation	Factory calibrated emulation preset for the DCI-P3 standard. Note the monitor's color gamut does not fully enclose the DCI-P3 color space.
		User-7	User-calibrated preset that must be set up before use.
		Luminance/Brightness	Adjusts the Luminance/Brightness level of the screen. The control range is 50 – 250 cd/m^2 with a step size of 1 cd/m^2.
		WhitePoint/Color Temp	Adjust the WhitePoint/Color Temp level of the screen. The control range is 4000 – 12,000 K with a step size of 100.
		Primaries and Gamma Information	Displays Primaries and Gamma information for the active Color Space preset.
		Reset to Factory Calibration	Returns Color Space preset to the factory calibrated settings.
		Reset to Last Calibration	Returns Color Space preset to the last calibrated settings.
	Image Control		Adjusts the screen image.
		Auto Adjustment	Automatically adjusts the screen image.
		Horizontal Position	Adjusts the position of the screen image left and right.
		Vertical Position	Adjusts the position of the screen image up and down.
		Custom Scaling	Selects the method on how displayed information on the monitor will be formatted. Select:

Table 4-2 OSD Menu (continued)

Icon	Main Menu	Submenu	Description
			• Fill to Screen—image fills the entire screen and may look distorted or elongated because of non-proportional scaling of height and width • Fill to Aspect Ratio—image is sized to fit the screen and maintains proportional image • One-to-one—disables video scaling, displays an image that is smaller in size than the monitor's capability and centers the image on the screen in the active viewing area • Overscan—enables over-scanning of the image for HDMI, Component, S-video, and Composite inputs • Crop Right Side—crops the video on the right side of the image (enabled for the supported horizontal resolutions over 1920 pixels) • Crop Left Side—crops the video on the left side of the image (enabled for the supported horizontal resolutions over 1920 pixels) • Crop Left and Right (Center)—crops the video on the left and right sides in equal amounts and centers the image (enabled for the supported horizontal resolutions over 1920 pixels)
		Clock	Minimizes any vertical bars or strips visible on the screen background. Adjusting the Clock will also change the horizontal screen image.
		Clock Phase	Adjusts the focus of the display. This adjustment allows you to remove any horizontal noise and clear or sharpen the image of characters.
		Black Level	Adjusts the black level or offset of the monitor. The factory default value is 128 (no offset) and the range is 0 to 255.
OD		OverDrive	Disables or enables the overdrive feature. The factory default is Enabled. **NOTE:** OverDrive improves the response time of the panel for watching motion video.
		Hue	Adjusts the Hue settings for the HDMI, Component, S-Video, and Composite inputs.
		Saturation	Adjusts the Saturation settings for the HDMI, Component, S-Video, and Composite inputs.
	PIP Control		Sets up PIP functionality. **NOTE:** DVI-I, HDMI, and DisplayPort are supported for the main window. Component, S-Video, and Composite are supported for the secondary window.
		PIP Mode	Enables PIP mode (PIP or Side-by-Side).
		PIP Position	Sets the position of the PIP window on the screen. The choices are top right, top left, bottom right, or bottom left.
		Sub Picture Select	Selects the input source for the PIP window. The choices are Component, S-Video, or Composite video signal inputs.

Table 4-2 OSD Menu (continued)

Icon	Main Menu	Submenu	Description
	Language		Selects the language in which the OSD menu is displayed. The factory default is English.
	Management		Selects the power management features of the monitor.
		Power Saver	Enables the power saving feature. Select: • On • Off The factory default is On.
		Power On Recall	Restores power to the monitor following an unexpected removal of power. Select: • On • Off The factory default is On.
DDC		DDC/CI Support	Allows the computer to control the OSD controls and calibrate the monitor. Set to: • On • Off The factory default is On.
		Firmware Update Support	Enables or disables the monitor support of firmware updates. The factory default is On. **NOTE:** The Firmware Update Support is automatically disabled when DDC/CI Support is disabled.
LED		Bezel Button LED	Disables or enables the bezel button backlight LEDs.
EDID		Auto EDID Update	Disables or enables the monitor's automatic update of the DVI, DisplayPort, and HDMI extended display identification data (EDID) based on the selected Color Space preset. The EDID will only be updated for the input selected for the primary window.
		Sleep Timer	Provides the timer adjustment menu options: • Set Current Time—sets the current time in hours and minutes • Set Sleep Time—sets the time you want to place the monitor in sleep mode • Set On Time—sets the time you want the monitor to wake up from sleep mode • Timer—sets the Sleep Timer feature On or Off. The default setting is Off • Sleep Now—immediately sets the monitor to enter sleep mode
	OSD Control		Provides a menu for adjusting the on-screen display (OSD) controls.

Table 4-2 OSD Menu (continued)

Icon	Main Menu	Submenu	Description
		Horizontal OSD Position	Changes the viewing position of the OSD menu to the left or right area of the screen. The factory default range is 50.
		Vertical OSD Position	Changes the viewing position of the OSD menu to the top or bottom area of the screen. The factory default range is 50.
		Function Control	Selects the operation of the front panel Function button. The options are Color Space, Brightness, Color Temp, Reset to Last, Black Level, OverDrive, Custom Scale, Crop (L-C-R), and PIP Control.
		Monitor Status Message	Disables or enables the Power-On Status Display and selects the position the OSD message is displayed on the screen.
		Warning Messages	Enables or Disables OSD recommendation messages.
		Calibration Limit	Sets the limit (in backlight hours) for the calibration message. The range is 0 to 5,000 hours. The factory default is 1000 hours. A value of 0 disables the timer. The number of backlight hours since the last calibration is also displayed.
		OSD Button Labels	Disables or enables the front panel button label display on the screen.
		Mode Display	Disables or enables the mode display information that is displayed on the bottom of the main menu.
		OSD Transparency	Adjust to view the background information through the OSD.
		OSD Timeout	Sets the time duration in seconds that the OSD is visible after the last button is pressed. The range is 10 – 60 seconds. The factory default is 40 seconds.
		OSD Rotation	Rotates the OSD menus and messages to support the monitor's Pivot feature. The choices are 0 and 90 degrees.
	Video Input Control		Provides a menu of the input options. The default input selection is DVI-I 1.
		DVI-1 Analog/Digital	Selects DVI-I 1 as the primary video input. This input accepts either analog or digital signals.
		DVI-2 Analog/Digital	Selects DVI-I 2 as the primary video input. This input accepts either analog or digital signals.
		HDMI	Selects HDMI as the primary video input.
		DisplayPort	Selects DisplayPort as the primary video input.
		Component	Selects Component as the primary video input.
		S-Video	Selects S-Video as the primary video input.
		Composite	Selects Composite as the primary video input.
		Input Auto-Switching	Enables or disables the monitor automatically switching to an active input if the current signal is inactive. The factory default is Enabled.
	Information		Selects and displays important information about the monitor.
		Current Settings	Provides the current input video mode.

Table 4-2 OSD Menu (continued)

Icon	Main Menu	Submenu	Description
		Recommended Settings	Provides the recommended resolution mode and refresh rate for the monitor.
		Serial Number	Reports the serial number of the monitor. The serial number is needed if contacting HP technical support.
		Version	Reports the firmware version of the monitor.
		Last Calibration	Displays the number of backlight hours since the last calibration.
		Backlight hours	Reports the total hours of backlight operation.
	Factory Reset		Returns all OSD menu settings and DDC/CI controls to the factory default settings, except the Language. **CAUTION:** A Factory Reset will result in the loss of all user control and Color Space settings. Use this feature only if other attempts to troubleshoot the monitor have been unsuccessful.
	Exit		Exits the OSD menu screen.

Optimizing Digital Conversion

Two controls in the on-screen display can be adjusted to improve image performance: Clock and Clock Phase.

NOTE: The Clock and Clock Phase controls are adjustable only when using an analog input. These controls are not adjustable for digital inputs.

The Clock must first be set correctly since the Clock Phase settings are dependent on the main Clock setting. Use these controls only when the auto-adjustment function does not provide a satisfactory image.

- **Clock**—Increases/decreases the value to minimize any vertical bars or stripes visible on the screen background.
- **Clock Phase**—Increases/decreases the value to minimize video distortion or video jitter.

NOTE: When using the controls, you will obtain the best results by using the auto-adjustment pattern software utility provided on the CD.

When adjusting the Clock and Clock Phase values, if the monitor images become distorted, continue adjusting the values until the distortion disappears. To restore the factory settings, select Yes from the Factory Reset menu in the on-screen display.

Using the HP Display Assistant Software

HP Display Assistant software, included on the software and documentation CD, is a software utility that guides you through the tuning process with easy to understand instructions and background patterns designed for each monitor control. It provides:

- The ability to set up and select from multiple color space presets.
- Software control of the monitor image and color settings to eliminate dependence on the monitor's front panel buttons and On-Screen Display (OSD) menu.

- Defined preset display settings for each individual user in a multi-user environment.
- Asset Management and Power Management capabilities that include remote control for individual or a group of displays on the domain from a centralized console application.
- Theft deterrence to help reduce unauthorized relocation of the monitor.

NOTE: Refer to the HP Display Assistant software user guide for additional information about the software.

Identifying Monitor Conditions

Special messages will appear on the monitor screen when identifying the following monitor conditions:

- **Input Signal Out of Range, Change Settings to 1920 x 1200 – 60Hz**—Indicates the monitor does not support the input signal because the resolution and/or refresh rate are set higher than the monitor supports.
- **No Input Signal**—Indicates the monitor is not receiving a video signal from the PC on the monitor video input connector. Check to determine if the PC or input signal source is off or in the power saving mode.
- **Auto Adjustment is in Progress**—Indicates the auto-adjustment function is active.
- **Monitor Going to Sleep**—Indicates the screen display is entering a sleep mode.
- **Check Video Cable**—Indicates the video cable is not properly connected to the computer.
- **OSD Lockout**—The OSD can be enabled or disabled by pressing and holding the Menu button on the front panel for 10 seconds. If the OSD is locked, the warning message **OSD Lockout** displays for ten seconds.
  - If the OSD is locked, press and hold the Menu button for 10 seconds to unlock the OSD.
  - If the OSD is unlocked, press and hold the Menu button for 10 seconds to lock the OSD.
- **Power Button Lockout**—Indicates the power button is locked. If the power button is locked, the warning message **Power Button Lockout** displays.
  - If the power button is locked, press and hold the power button for 10 seconds to unlock the power button function.
  - If the power button is unlocked, press and hold the power button for 10 seconds to lock out the power button function.
- **Recommend Recalibration for Best Color Performance**—Indicates the calibration limit has been reached or a change has been made to one of the color controls (RGB primaries, Gamma, Luminance, WhitePoint, or Black Level)
- **Color Settings have Changed, Recommend you Update the Monitor Color Profile**—Indicates the need to change the color profile for the OS when the active color space preset or settings have been changed.
- **Recommend Minimum 30 Minute Warm-up for Best Color Performance**—Indicates a minimum 30 minute warm-up period is recommended after the monitor is first powered on or comes out of Sleep mode (when not displaying video for 30 minutes or more).

- **Scanning Inputs. Please Wait**—Indicates the monitor is in the process of scanning the DVI (analog and digital), DisplayPort, and HDMI inputs.
- **Color Gamut Remapping Enabled**—Indicates the color gamut remapping has been enabled because the monitor video input or video signal changed from YUV to an RGB signal.
- **Color Gamut Remapping Disabled**—Indicates the color gamut remapping has been disabled because the monitor video input or video signal changed from RGB to a YUV signal.

Sleep Timer Mode

The Sleep Timer mode is an energy-saving feature that enables you to set a time for the monitor to power on and off at the same time every day. This also extends the life of the backlight bulbs in the monitor. The Sleep Timer has five settings:

- Set Current Time
- Set Sleep Time
- Set On Time
- Timer: On/Off
- Sleep Now

To set the timer:

1. Press the Menu button on the monitor front panel to display the **OSD Menu**.
2. Scroll down and highlight **Management**.
3. Press the Menu button to select **Management**.
4. Scroll down and highlight and select **Sleep Timer > Set Current Time**.

> **NOTE:** You must set the current local time before you reset the time for **Sleep Time** or **On Time**. Note that the time is displayed in a 24–hour clock format. For example, 1:15 p.m. is displayed as 13 hours 15 minutes.

5. Press the Menu button once to enter the adjustment mode for hours.
6. Press the - (Minus) or + (Plus) button to adjust the hour.
7. Press the Menu button again to enter the time for minutes.
8. Press the - (Minus) or + (Plus) button to adjust the minutes.
9. Press the Menu button to lock in the time chosen.
10. After setting the current time, the highlight automatically skips to **Set Sleep Time hours**. Repeat steps 6 through 9 to set **Sleep Time**.
11. If you do not want to set **Sleep Time**, press the Menu button twice, then select **Save and Return** to exit the menu.
12. After setting **Sleep Time**, the highlight automatically skips to **Set On Time hours**. Repeat steps 6 through 9 to set **On Time**.

13. Set the **Timer mode** to **On** to activate the **Sleep Timer** settings.

14. When you are finished, select **Save and Return** to exit the menu.

The fifth selection, **Sleep Now**, turns the monitor backlights off immediately and stays in sleep mode until the next **On Time** activates or a monitor button is pressed.

Recommended Options

For Microsoft Windows and Macintosh users, HP recommends purchasing the HP/X-Rite color calibration kit. The calibration kit is required to set up new color space presets and calibrate the monitor to maintain the color performance. For more information on the color calibration kit, refer to http://www.hp.com.

For best color performance, HP recommends the monitor be used in an environment with minimal ambient light. If the monitor is used in a typical office environment with bright overhead lights, HP recommends using a monitor hood to minimize ambient light. For more information on the monitor hood, refer to http://www.hp.com.

A Advanced Color Management Features and Usage

The HP LP2480zx monitor provides several advanced features that make it particularly well-suited to color-critical applications, such as professional computer graphics development, video production, and similar uses. These include:

- True 10-bit drivers in the LCD panel itself, and the ability to support true 10 bits/color (30 bits/pixel) video through the DisplayPort 1.1 and HDMI 1.3 inputs.
- An LED backlight unit (instead of the usual cold-cathode fluorescent, or CCFL type) with independent control of the red, green, and blue channels. This permits white point control using the backlight, and a very wide range of white level (peak luminance) settings.
- The LED backlight, coupled with specially-selected color filters in the LCD, provides a very wide gamut (133% of the 1953 NTSC gamut area, as expressed in the CIE 1976 *u′v′* space) for this monitor. As this gamut encloses a number of standard output device gamuts, such as Adobe RGB and sRGB/Rec. 709, this enables accurate emulation of these standards by means of gamut-adaptation capabilities built into the monitor.

NOTE: In the earlier 1931 CIE *xy* space, the gamut area of the LP2480zx is 110% that of the 1953 NTSC gamut.

- The monitor “front-end” electronics provides support for the gamut adaptation mentioned above, including numerous factory-adjusted color space presets, which permit the user to quickly set up the monitor to accurately emulate these standard output device specifications. The factory-calibrated presets include Adobe RGB, sRGB, ITU-R Rec. BT-709, SMPTE-C, and the Digital Cinema Initiative reference projector (informally known as DCI-P3, also SMPTE-431-2) output device spaces, in addition to space for a user-adjustable preset.
- The user preset permits the setup of a custom color space emulation, with full control over the desired RGB primaries, white point, white luminance, and gamma (display transfer function).

This Appendix will detail the operation and usage of these features provided on the LP2480zx monitor.

Color Gamut and Color Space Coverage

The LP2480zx monitor uses an LED-backlit LCD module that provides an extremely wide color gamut. This gamut was chosen to enclose a number of color spaces as defined by various standard output device specifications, which (along with other color-management features in this product's electronics) permits the monitor to accurately emulate display devices conforming to these standards. The nominal native primary set, white point, and gamma of the LP2480zx, and those of the various supported standards, are provided in the table below:

Table A-1 Supported Color Gamut and Color Space

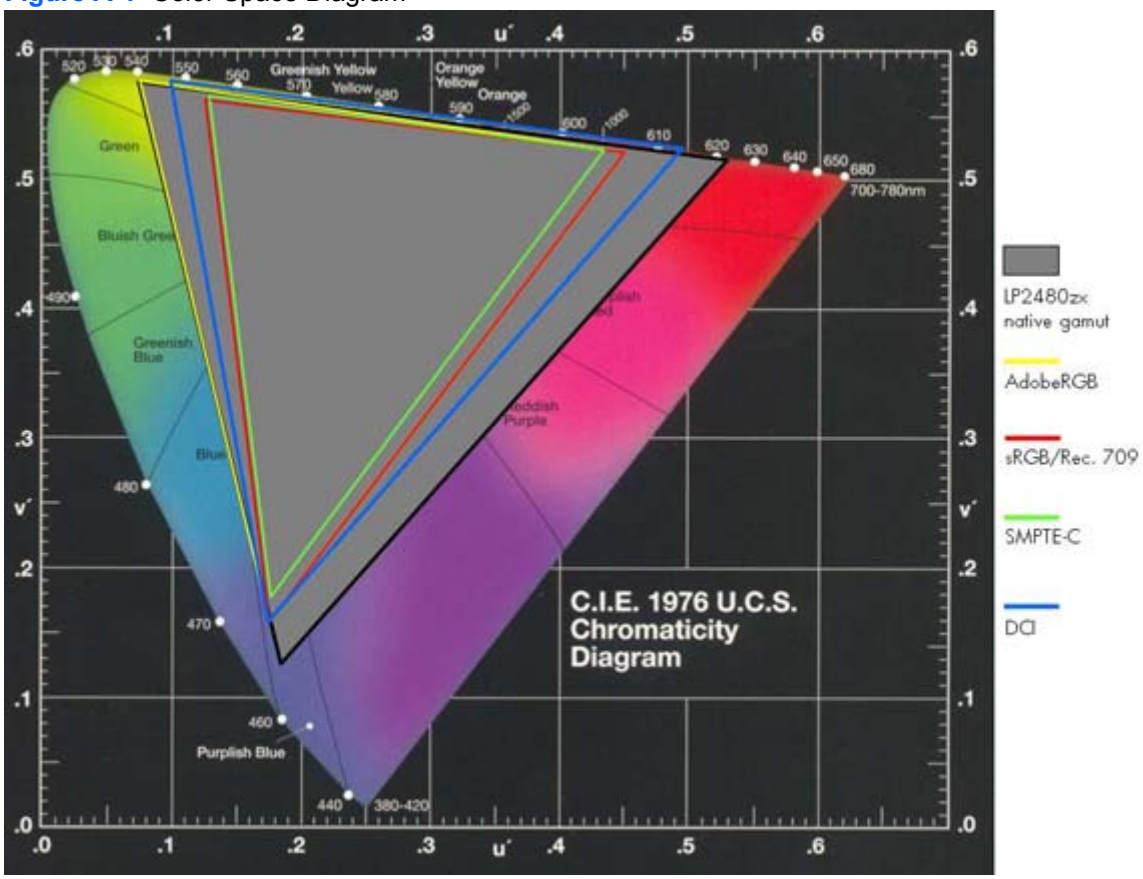
		Full	Adobe RGB	SMPTE-C	ITU-Rec. BT. 709	sRGB	DCI-P3 (SMPTE-431-2)†
White point:							
Color temp (CCT)		6500K	6500K	6500K	6500K	6500K	~6300K
	x	0.313	0.313	0.313	0.313	0.313	0.314
	y	0.329	0.329	0.329	0.329	0.329	0.351
	u'	0.198	0.198	0.198	0.198	0.198	0.191
	v'	0.468	0.468	0.468	0.468	0.468	0.480
Red	*x*	0.690	0.640	0.630	0.640	0.640	0.680
	y	0.300	0.330	0.340	0.330	0.330	0.320
	u'	0.529	0.451	0.433	0.451	0.451	0.496
	v'	0.517	0.523	0.526	0.523	0.523	0.526
Green	*x*	0.205	0.210	0.310	0.300	0.300	0.265
	y	0.715	0.710	0.595	0.600	0.600	0.690
	u'	0.073	0.076	0.130	0.125	0.125	0.099
	v'	0.576	0.576	0.563	0.563	0.563	0.578
Blue	*x*	0.150	0.150	0.155	0.150	0.150	0.150
	y	0.045	0.060	0.070	0.060	0.060	0.060
	u'	0.185	0.175	0.176	0.175	0.175	0.175
	v'	0.125	0.158	0.178	0.158	0.158	0.158
Gamma		2.2	2.2	2.2	~2.2*	~2.2*	2.6

* The display response specified by the sRGB and ITU-R Rec. BT.709 standards cannot be accurately described by a simple gamma value; see Transfer Function (Gamma) on page 39 in this appendix for details.

† The Digital Cinema/SMPTE-431-2 reference projector gamut is not fully enclosed by the LP2480zx's native gamut; when set to the DCI preset, the monitor will provide as accurate an emulation of this space as possible within its available gamut. The difference is primarily along the red-green edge of the DCI gamut, as the DCI red and green primaries are slightly outside the LP2480zx gamut. See the diagram below.

As plotted within the 1976 CIE *u*'*v*' color space, these gamuts are shown below:

Figure A-1 Color Space Diagram



Color Space Emulation

As noted earlier, the LP2480zx has the capability of emulating a display that conforms to a number of standard output device specifications, such as sRGB, Adobe RGB, and et cetera. This emulation includes matching the specified primaries, transfer function (gamma), white point, and, where appropriate, white level (luminance) of the target specification. Preset color spaces are provided as described earlier, and in addition, the user may program custom spaces as desired. Full custom color space programming involves the selection of primaries, white point, gamma value, and et cetera, which may be accomplished using the optional HP/X-Rite calibration tool. However, the display luminance (brightness) and white point may be adjusted using the on-screen display (OSD) or HP Display Assistant software.

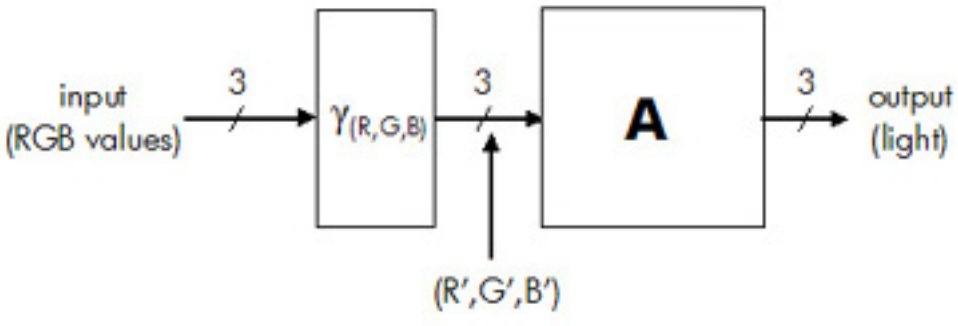
The following sections describe the theory behind this emulation, the hardware provided to support it in the LP2480zx, and information on its usage.

Theory of Operation

In general, most display devices such as CRT- or LCD-based monitors, may be mathematically modeled as comprising two functions: first, a mapping of the input values (which we will assume for this discussion are in the form of "RGB" codes, that is, the relative values of red, green, and blue levels for each pixel in the image) to the intensity of light output by the device for each (this is the display's transfer function, sometimes referred to as the gamma, for each of the three channels). This now "gamma adjusted" data must also be mapped to the specific primary colors and intensities provided by the display device for

each of the three channels (that is, exactly what will be output, in terms of light, for the given values of red, green, and blue). This may be expressed by the following diagram:

Figure A-2 Model of Standard Display Device



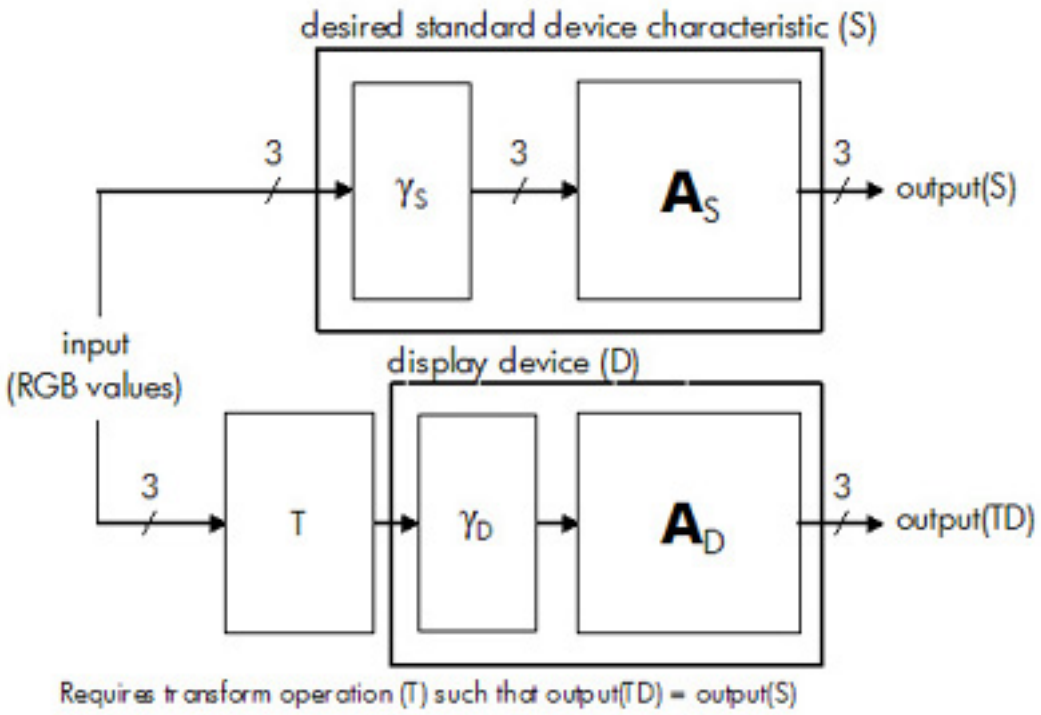
Here, the input RGB values are first modified by the appropriate transfer function (γ_R, γ_G, or γ_B); this operation may be viewed as being performed by three look-up tables (LUTs) of the appropriate width and depth. The modified RGB values (R′, G′, and B′) are then mapped to the resulting output light levels of the correct intensity and color. This may be viewed as a matrix multiplication operation (**A**) involving the R′G′B′ values and the appropriate *XYZ* tristimulus values for the specific display device primaries, luminance, and white point in question:

Figure A-3 Matrix Multiplication of Input Values

$$\begin{bmatrix} R' & G' & B' \end{bmatrix} X \begin{bmatrix} X_R & Y_R & Z_R \\ X_G & Y_G & Z_G \\ X_B & Y_B & Z_B \end{bmatrix} = [X', Y', Z'] \text{ output}$$

In essence, the R′, G′, and B′ values may be seen as “gain controls” on three light sources whose peak outputs are described as (X_R,Y_R,Z_R), (X_G,Y_G,Z_G), and (X_B,Y_B,Z_B). The display device itself – in this case, the LCD module used in the LP2480zx monitor – of course has its own native characteristics which may be modeled as described above. The problem of emulating a different (presumably, standard) output device characteristic is then one of adding a “transform” block (T, in the diagram below) which will modify this native characteristic such that the overall system emulates the desired performance. In terms of the above diagram, if the combination of γ_S and $\mathbf{A}_S$ represent the desired standard characteristic, it is the function of the transform block T to correct the native display characteristics (γ_D and $\mathbf{A}_D$) such that the output (TD) of this system matches that of the standard device, for the same input values:

Figure A-4 Correcting Native Display Characteristics

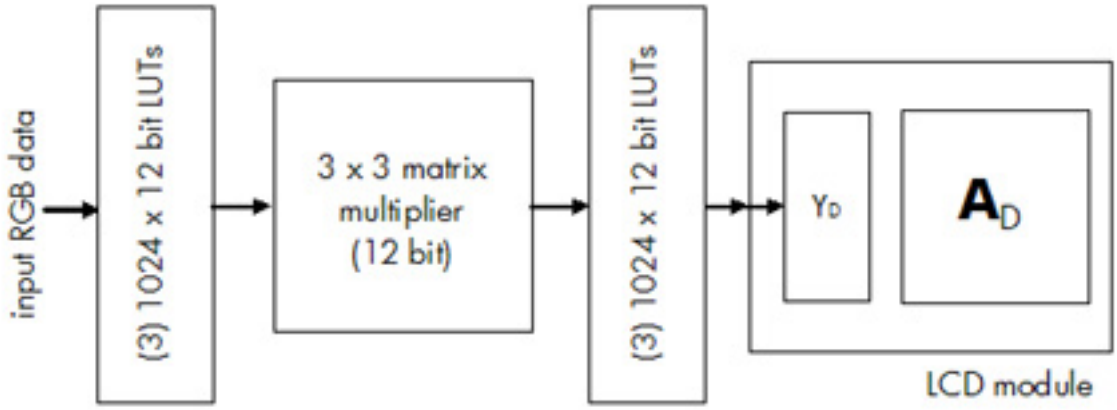


It can be shown that the required transform (T) may be implemented as a pair of appropriately-sized look-up tables (LUTs), on either side of a 3 x 3 matrix multiplication. The LUT preceding the matrix multiplication (the “pre-LUT”) implements the desired standard transfer function or gamma response curve, such that input values are correctly mapped per that standard into a “linear light” space. The required matrix for the color remapping (which is referred to as **R**) is a combination of the matrix that transforms R′G′B′ to *X′Y′Z′* values under the target standard ($\mathbf{A}_S$), and the inverse of the corresponding matrix for the existing display device ($\mathbf{A}_D$). In other words,

$$\mathbf{R} = \mathbf{A}_D^{-1}\mathbf{A}_S$$

This stage must then be followed by a second look-up table (the “post-LUT”), which linearizes the existing display device; specifically, it contains the inverse of the display’s transfer functions $\gamma_{D(R,G,B)}$. The complete transform block (plus the LCD module) as implemented in the LP2480zx monitor is then:

Figure A-5 Color Space Conversion Hardware in the LP2480zx



Note that since the look-up tables for the three channels (R, G, and B) are independent, differences in the display device's transfer function across these three, along with any minor errors in the display white point, may be "nulled out" using the look-up tables, in addition to the operations required for the color space emulation as described above. In the LP2480zx, these functional blocks are implemented as part of the "front end" electronics, in addition to the usual scaler/controller functions of a standard monitor.

Due to the limitations imposed by the components used in the LP2480zx front end, full color space emulation functionality is not available on the analog composite, component, or S-Video inputs*; it is, however, fully supported when using the DVI-I (both analog and digital sections), HDMI, and DisplayPort inputs IF the input video is provided using RGB encoding. Color space emulation is not provided on any input for video using *YUV/YC$_B$C$_R$* encoding. The complete matrix of feature support for the various inputs and signal encodings is provided in the table on the following page.

NOTE: * These inputs connect between the pre-LUTs and the 3x3 matrix multiplier; therefore, re-mapping of the input values per the desired output device transfer function is not possible.

Selection of the desired standard color space, or selection of a user-defined custom color space setting, may be achieved through the on-screen display (OSD) menus, the HP Display Assistant software, or the optional HP/X-Rite calibration software. These provide the correct programming of the color management hardware described above as needed for the desired color space characteristics.

NOTE: Refer to the monitor's DDC/CI and USB communication specification for more details.

Summary of Color Space Selection Availability

As noted, the selection of output device color space presets and the resulting emulation of the desired display characteristics, is not available for all LP2480zx inputs or all color encodings. Basically, this functionality is available only when a progressive-scanned RGB input is provided by the video source. YUV (which is considered here as including YC$_B$C$_R$, et cetera) encoding cannot be used, nor can color space emulation be supported for interlaced video (as the LP2480zx must convert any interlaced video to YUV, if not in this form already, in order for the built-in de-interlacing to operate correctly). When support for the standard or user-defined color space presets cannot be provided, these options will be "grayed out" on the OSD, and adjustments for image Hue and Saturation will be provided instead.

Table A-2 Supported Signal Inputs and Color Space Matrix

Input used	Color encoding	Scan format	Result
DVI	RGB (YUV not supported on these inputs)	Progressive	Color Space presets: enabled
			Hue/Saturation controls: disabled
HDMI or DisplayPort	RGB	Progressive	Color Space presets: enabled
			Hue/Saturation controls: disabled
		Interlaced	Color Space presets: disabled
			Hue/Saturation controls: enabled
	YUV	Either	Color Space presets: disabled
			Hue/Saturation controls: enabled

Table A-2 Supported Signal Inputs and Color Space Matrix (continued)

Input used	Color encoding	Scan format	Result
Component, CVBS, S-Video	YUV (RGB not supported)	Either	Color Space presets: disabled
			Hue/Saturation controls: enabled

10 bits/color LCD Module

As noted earlier, the LCD module in the LP2480zx monitor provides a 10 bits/color (30 bits/pixel) input, with true 10-bit drivers within the LCD itself. This means that each primary (red, green, and blue) may be controlled over 1,024 steps (input codes 0 to 1023) from the black level to the white (peak luminance for that color). This results in over 1.07 billion separate colors available within the display's gamut, versus approximately 16.7 million for a conventional 8 bits/color display.

This increase in dynamic range is required for the accurate display of color within the wide gamut provided by the LP2480zx's LCD, and especially for achieving the necessary degree of color accuracy within the more restricted gamuts that this monitor is capable of providing when emulating various standard output devices. Increasing a display's color gamut – the area covered by the display when the primaries are plotted on a standard chromaticity diagram – would result in a greater difference between adjacent colors if the degree of control (bits per color) for each primary were not also increased. Increasing the bit depth of the display drivers achieves this without the possibility of undesirable image artifacts which may result from temporal or spatial dithering as may sometimes be used with an LCD of lower inherent accuracy. (The LP2480zx's "front-end" electronics are also, however, capable of providing temporal dithering, if needed, to increase the delivered accuracy beyond the 10 bits/color level. By default, this is used only between the pre-LUT and the 3x3 matrix multiplier stage; temporal dithering is possible but normally disabled at the 30-bit connection between the post-LUT and the LCD module itself.)

With most video sources (which typically provide video information at the standard 8 bits/color or 24 bits/pixel), and across all of the LP2480zx's various inputs, the increased accuracy of the LP2480zx LCD module is used to provide more accurate color within the selected standard color space. However, 30-bit sources may also be directly supported using the DisplayPort 1.1 and HDMI 1.3 inputs only. This will be of greatest benefit when the LP2480zx is used in the wider-gamut modes (such as Full, Adobe RGB, DCI).

LED Backlight Unit

As noted earlier, the LP2480zx monitor employs a backlight consisting of an array of red, green, and blue light-emitting diodes (LEDs) rather than the more typical cold-cathode fluorescent lamps (CCFLs) on most LCD monitors. This provides several significant advantages, in addition to the obvious benefit of a wider color gamut (that is, more saturated primaries) than can currently be achieved using CCFLs. In the LP2480zx, the red, green, and blue LED arrays are controlled both collectively and separately by a dedicated backlight controller, which permit both very accurate setting of the display luminance as well as control of the white point of the unit. Color sensors in the backlight unit feed color information back to the controller constantly, permitting an accurate white point to be maintained.

Compared with CCFLs, which have only a limited range of brightness control available and a fixed emission spectrum, the LED backlight used here provides a very wide range of both brightness and color control. The white point may be adjusted over a range corresponding to a correlated color temperature (CCT) of 4,000K to 12,000K, including support for all standard white points with CCTs within this range. In addition, the white luminance may be adjusted from a maximum of approximately 250 cd/m^2 down to 50 cd/m^2, making the LP2480zx suitable for use in low-light environments; at the lower

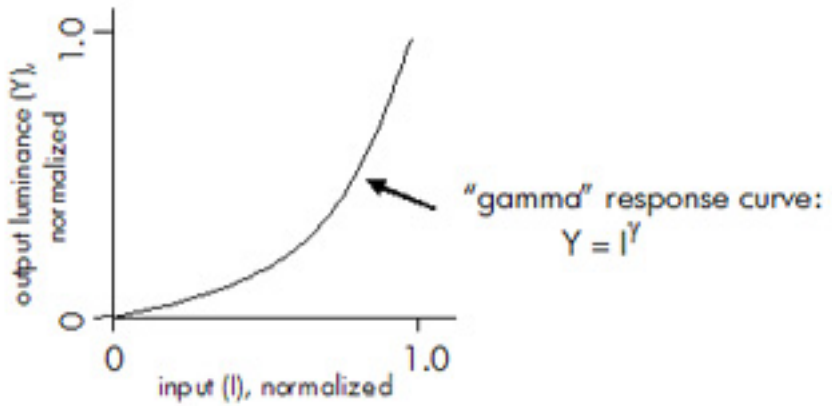
brightness settings, both its white luminance and black level compare favorably with those of traditional CRT displays. (At the low end of this range, the monitor's black level will typically be approximately 0.05 cd/m^2.)

As with several other parameters set in the color space presets, the programming of the backlight controller is managed either through the LP2480zx's on-screen display (OSD), or by using the HP Display Assistant software.

Transfer Function (Gamma)

As noted briefly in the previous section on Color Space Emulation on page 34 in this Appendix, display devices typically impose a non-linear transfer function on the input video data, in terms of how the intensity of the light output by the device varies versus these inputs. This is often referred to as the display's "gamma" response characteristic, as one simple model for this behavior is a power-function curve (in which the exponent is typically represented by the Greek letter gamma, γ) as follows:

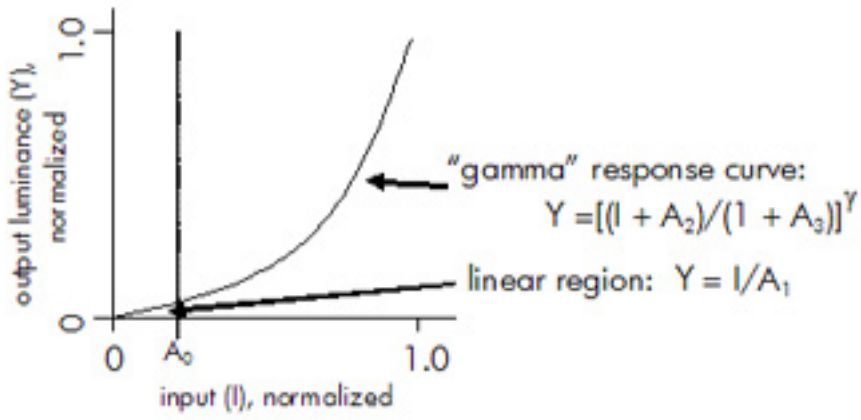
Figure A-6 Gamma Curve Response Characteristic



This model, with a "gamma" value of about 2.2 – 2.5, describes the actual response of a standard CRT display fairly well,* and so was assumed for years to be the typical response curve of an electronic display device. As it turns out, encoding image information under the assumption of an output device response of this nature has other advantages, and so it remains very common for standard output device specifications to require a transfer function or response curve which is of this general nature. The most common modification to this simple model as seen in many current output device or image encoding standards is the addition of a linear region at the lower end of the response curve, as shown in the following diagram. This linear region avoids problems, which otherwise would result from applying the inverse of the response curve (in image encoding), as otherwise the slope of the curve would be changing very rapidly in the low-luminance regions of the image.

NOTE: * The biggest shortcoming of the simple gamma curve model as given, with respect to CRT displays, is that the black level of the input signal (assumed to be zero) does not generally result in exactly zero luminance for a properly-adjusted CRT. This requires the addition of an offset term into the model. However, the basic model as shown here remains an adequate description for most non-critical work.

Figure A-7 Low Linear Region Response Curve



A generalized model for the display response curve accommodating the addition of a linear section as shown above thus requires the specification of four parameters in addition to the “gamma” exponent value:

For input values (I) ≤ A_0:

$Y = I/A_1$

For input values (I) > A_0′

$Y = [(I + A_2)/(1 + A_3)]^{\gamma}$

The response of the LP2480zx is automatically set to the correct standard as part of the color-space selection, using either the on-screen display (OSD) or using the HP Display Assistant software, or using the optional HP/X-Rite color calibration tools. Independently programming a custom response (as in the case of the user-defined custom color space preset) requires use of the HP/X-Rite calibration tools. Using the software provided with this calibration product, the display response may be programmed using the four-value-plus-gamma model described above.

Several of the standard color space specifications supported by the LP2480zx require the use of the “four-value” model, as they include a linear section in the response curve as described above. Of course, even the simple “gamma-only” model may be accommodated within the four-value model, by setting the A_0, A_2, and A_3 parameters to zero, and A_1 to a value of 1.0. The values used to describe the response for the standard color spaces or output device specifications supported by the LP2480zx are listed in the table below.

Table A-3 Response Curve Constants for Various Color Spaces

Color space	A_0	A_1	A_2	A_3	gamma (γ)
sRGB	0.04045	12.92	0.055	0.055	2.4
ITU-R BT.709	0.081	4.50	0.099	0.099	2.22222
SMPTE-C	0.081	4.50	0.099	0.099	2.22222
Adobe® RGB	0	1	0	0	2.19922
DCI-P3	0	1	0	0	2.6

Table A-3 Response Curve Constants for Various Color Spaces (continued)

Color space	A_0	A_1	A_2	A_3	gamma (γ)
Full	0	1	0	0	2.2*

* Note that in “full gamut” mode, the color space emulation capabilities of the LP2480zx monitor are used to correct any deviations in the LCD’s native performance from its nominal specified values. The color gamut, white point, and response curve seen in this mode are therefore those of the LCD panel itself, but corrected to their nominal values as accurately as possible.

References:

- *Adobe® RGB (1998) Color Image Encoding*, Version 2005-05, May 2005, Adobe Systems, Inc.

  http://www.adobe.com/digitalimag/pdfs/AdobeRGB1998.pdf

- *Digital Cinema System Specification, Vers. 1.1*, April 12, 2007 Digital Cinema Initiatives, LLC

  http://www.dcimovies.com

- IEC 61966-2-1:1999 *Colour Measurement and Management in Multimedia Systems and Equipment – Part 2-1: Default RGB Colour Space – sRGB*, International Electrotechnical Commission, TC 100

  http://tc100.iec.ch/index_tc100.html

- ITU Recommendation BT. 709: *Parameter values for the HDTV standards for production and international programme exchange*, April 2002, International Telecommunications Union

  http://www.itu.int/net/home/index.aspx

- SMPTE Recommended Practice 145-2005, *SMPTE-C Color Monitor Colorimetry*

- SMPTE Standard 431-2, *Reference Projector and Environment for Display of DCDM in Review Rooms and Theaters*, Society of Motion Picture and Television Engineers

  http://www.smpte.org

B Troubleshooting

Solving Common Problems

The following table lists possible problems, the possible cause of each problem, and the recommended solutions.

Problem	Possible Cause	Solution
Screen is blank.	Power cord is disconnected.	Connect the power cord.
	Power button on front panel of the monitor is turned off.	Press the front panel power button. **NOTE:** If pressing the power button has no effect, press and hold the power button for 10 seconds to disable the power button lockout feature.
	Video cable is improperly connected.	Connect the video cable properly. Refer to Setting Up the Monitor on page 7 for more information.
	Screen blanking is active.	Press any key on the keyboard or move the mouse to inactivate the screen blanking utility.
Monitor will not turn on.	Master power switch on rear panel of the monitor is turned Off.	Turn the master power switch to On.
Image appears blurred, indistinct, or too dark.	Brightness is too low.	Press the – (minus) button on the front panel. If this does not correct the image, press the Menu button to open the OSD Menu, and adjust the brightness scale as needed.
Image is not centered	Position may need adjustment.	Press the Menu button to access the OSD menu. Select Image Control/Horizontal Position or Vertical Position to adjust the horizontal or vertical position of the image.
Check Video Cable is displayed on screen.	Monitor video cable is disconnected.	Connect the appropriate video signal cable between the computer and monitor. Be sure that the computer power is off while connecting the video cable.
Input Signal Out of Range, Change Settings to 1920 x 1200 – 60Hz is displayed on screen.	Video resolution and/or refresh rate are set higher than what the monitor supports.	Restart the computer and enter Safe Mode. Change the settings to a supported setting (see Recognizing Preset Display Resolutions on page 46). Restart the computer so that the new settings take effect.
The monitor is off but it did not seem to enter into a low-power sleep mode.	The monitor's power saving control is disabled.	Check the monitor's OSD menu setting for power saving enable/disable controls. The control should be set to enable to allow the monitor to enter into low-power modes.
OSD Lockout is displayed.	The monitor's OSD Lockout function is enabled.	Press and hold the Menu button for 10 seconds to disable the OSD Lockout function.
Power Button Lockout is displayed.	The monitor's Power Button Lockout function is enabled.	Press and hold the power button for 10 seconds to unlock the power button function.

Using the Worldwide Web

For the online access to technical support information, self-solve tools, online assistance, community forums of IT experts, broad mutlivendor knowledge base, monitoring and diagnostic tools, go to http://www.hp.com/support

Preparing to Call Technical Support

If you cannot solve a problem using the trouble shooting tips in this section, you may need to call technical support. Have the following information available when you call:

- The monitor
- Monitor model number
- Serial number for the monitor
- Purchase date on invoice
- Conditions under which the problem occurred
- Error messages received
- Hardware configuration
  - Video card
  - Type of computer
  - Cable input used (for example, HDMI, VGA, DVI, or DisplayPort)
- Calibration system used
- Hardware and software you are using

C Technical Specifications

NOTE: All performance specifications are provided by the component manufacturers. Performance specifications represent the highest specification of all HP's component manufacturers' typical level specifications for performance and actual performance may vary either higher or lower.

HP LP2480zx Model

Table C-1 HP LP2480zx Model Specifications

Display	61 cm	24 inches
Type	TFT LCD	
Viewable Image Size	61 cm diagonal	24–inch diagonal
Tilt Adjustment	-5 to 35°	
Swivel Adjustment	-45 to 45°	
Height Adjustment	100 mm range	3.94–inch range
Pivot	Clockwise	
Maximum Weight (Unpacked)	12.5 kg	27.5 lbs.
Dimensions (include base)		
Height	42.5 cm	16.7 inches
Depth	25.4 cm	10.0 inches
Width	56.5 cm	22.2 inches
Optimum Graphic Resolution	1920 × 1200 (60Hz) analog input	
	1920 × 1200 (60Hz) digital input	
Text Mode	720 × 400	
Dot Pitch	0.270 (H) × 0.270 (W) mm	
Horizontal Frequency	24 to 76 kHz	
Vertical Refresh Rate	47 to 61 Hz	
Environmental Requirements Temperature		
Operating Temperature	5 to 35° C	41 to 95° F
Storage Temperature	-20 to +60° C	-4 to 140° F
Relative Humidity	20 to 80%	

Table C-1 HP LP2480zx Model Specifications (continued)

Power Source	90 — 265 VAC, 45–63 Hz	
Altitude:		
Operating	0 to 3657.6 m	0 to 12,000 feet
Storage	0 to 12192 m	0 to 40,000 feet
Power Consumption (maximum)	<90 watts	
Input Terminal	Two DVI-I connectors with DVI-I to DVI-D and DVI-I to VGA cables included; DisplayPort connector with cable included; HDMI connector with cable included; Component connectors; S-Video connector; Composite connector	

Recognizing Preset Display Resolutions

The display resolutions listed below are the most commonly used modes and are set as factory defaults. This monitor automatically recognizes these preset modes and they will appear properly sized and centered on the screen.

Table C-2 LP2480zx Model Factory Preset Display Modes

Preset	Pixel Format	Horz Freq (kHz)	Horz Polarity	Vert Freq (Hz)	Vert Polarity	Pixel Clk (MHz)	Source
1	640 × 480	31.47	–	59.94	–	25.175	VGA
2	640 × 480	37.50	–	75.00	–	31.500	VGA
3	720 × 400	31.47	–	70.08	+	28.321	VGA
4	800 × 600	37.88	+	60.32	+	40.000	VESA
5	1024 × 768	48.36	–	60.00	–	65.000	VESA
6	1152 × 720	44.86	–	60.0o	+	66.750	CVT 0.83MA DVT 16:10
7	1280 × 768	47.396	+	60.00	–	68.250	CVT 0.98M9-R
8	1280 × 960	60.00	+ –	60.00	+ –	108.000	VESA
9	1280 × 1024	63.98	+	60.02	+	108.000	VESA
10	1600 x 1000	61.648	+	60.00	–	108.500	CVT 1.60MA-R
11	1600 × 1200	75.00	+	60.00	+	162.000	VESA
12	1680 × 1050	65.29	–	60.00	+	146.250	CVT 1.76MA
13	1920 × 1080	67.158	–	60.00	+	173.000	CVT 2.07M9 DTV 16:9
14	1920 × 1200	59.257	–	47.943	+	150.750	CVT
15	1920 × 1200	74.04	+	60.00	–	154.000	CVT 2.30MA-R
16	1920 × 1200	74.56	–	60.00	+	193.250	CVT 2.30MA
17	2048 x 1080	53.347	–	47.931	+	144.250	CVT
18	2048 x 1080	66.576	+	59.924	–	147.000	CVT-R
19	2048 x 1200	59.283	–	47.964	+	161.250	CVT
20	2048 x 1200	74.049	+	59.959	–	163.500	CVT-R

NOTE: The 2048 x 1200 – 60 Hz mode is only supported on the DVI Digital, HDMI, and DisplayPort inputs.

The following high definition modes are also supported.

Table C-3 LP2480zx Model High Definition Video Formats

Preset	Timing Name	Pixel Format	Horz Freq (kHz)	Vert Freq (kHz)	Pixel Rate (MHz)	OSD Display
1	480i	720 x 480	15.734	60	13.5	480i
2	480p	720 x 480	31.469	60	27	480p
3	720p60	1280 x 720	45	60	74.25	720p-60Hz
4	1080i60	1920 x 1080	33.75	60	74.25	1080i-60Hz
5	576i	720 x 576	15.625	50	13.5	576i
6	576p	720 x 576	31.25	50	27	576p
7	720p50	1280 x 720	37.5	50	74.25	720p-50Hz
8	1080i50	1920 x 1080	28.125	50	74.25	1080i-50Hz
9	1080p60	1920 x 1080	67.5	60	148.5	1080p-60Hz
10	1080p50	1920 x 1080	56.25	50	148.5	1080p-50Hz

Entering User Modes

The video controller signal may occasionally call for a mode that is not preset if:

- You are not using a standard graphics adapter.
- You are not using a preset mode.

It this occurs, you may need to readjust the parameters of the monitor screen by using the on-screen display. Your changes can be made to any or all of these modes and saved in memory. The monitor automatically stores the new setting, then recognizes the new mode just as it does a preset mode. In addition to the factory preset modes, there are twenty user modes that can be entered and stored.

Energy Saver Feature

When the monitor is in its normal operating mode, the monitor uses less than 90 watts of power and the Power light is green.

The monitor also supports a reduced power state. The reduced power state will be entered into if the monitor detects the absence of either the horizontal sync signal and/or the vertical sync signal. Upon detecting the absence of these signals, the monitor screen is blanked, the backlight is turned off, and the power light is turned amber. When the monitor is in the reduced power state, the monitor will utilize less than 3 watts of power. There is a brief warm up period before the monitor will return to its normal operating mode.

Refer to the computer manual for instructions on setting energy saver features (sometimes called power management features).

NOTE: The above power saver feature only works when connected to computers that have energy saver features.

By selecting the settings in the monitor's Energy Saver utility, you can also program the monitor to enter into the reduced power state at a predetermined time. When the monitor's Energy Saver utility causes the monitor to enter the reduced power state, the power light blinks amber.

D Agency Regulatory Notices

Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC Rules and Regulations.

Declaration of Conformity for Products Marked with the FCC Logo (United States Only)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

For questions regarding the product, contact:

Hewlett Packard Company

P. O. Box 692000, Mail Stop 530113

Houston, Texas 77269-2000

Or, call 1-800-HP-INVENT (1-800 474-6836)

For questions regarding this FCC declaration, contact:

Hewlett Packard Company

P. O. Box 692000, Mail Stop 510101

Houston, Texas 77269-2000

Or, call (281) 514-3333

To identify this product, refer to the Part, Series, or Model number found on the product.

Canadian Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Avis Canadien

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union Regulatory Notice

This product complies with the following EU Directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth).
XXXX*
This marking is valid for EU non-harmonized Telecom products.
*Notified body number (used only if applicable - refer to the product label)

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth)	This marking is valide for EU non-harmonized Telecom products. *Notified body number (used only if applicable — refer to the product label).

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

German Ergonomics Notice

HP products which bear the “GS” approval mark, when forming part of a system comprising HP brand computers, keyboards and monitors that bear the “GS” approval mark, meet the applicable ergonomic requirements. The installation guides included with the products provide configuration information.

Japanese Notice

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取扱説明書に従って正しい取り扱いをして下さい。

Korean Notice

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서
주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

Power Cord Set Requirements

The monitor power supply is provided with Automatic Line Switching (ALS). This feature allows the monitor to operate on input voltages between 100–120V or 200–240V.

The power cord set (flexible cord or wall plug) received with the monitor meets the requirements for use in the country where you purchased the equipment.

If you need to obtain a power cord for a different country, you should purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the cross-sectional area of the wire must be a minimum of 0.75 mm^2 or 18 AWG, and the length of the cord must be between 6 feet (1.8 m) and 12 feet (3.6 m). If you have questions about the type of power cord to use, contact an authorized HP service provider.

A power cord should be routed so that it is not likely to be walked on or pinched by items placed upon it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

Japanese Power Cord Requirements

For use in Japan, use only the power cord received with this product.

△ **CAUTION:** Do not use the power cord received with this product on any other products.

Product Environmental Notices

Materials Disposal

This HP product contains mercury in the fluorescent lamp in the display LCD that might require special handling at end-of-life.

Disposal of this material can be regulated because of environmental considerations. For disposal or recycling information, contact the local authorities or the Electronic Industries Alliance (EIA) http://www.eiae.org.

Disposal of Waste Equipment by Users in Private Household in the European Union

This symbol on the product or on its packaging indicates that this product must not be disposed of with your household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling or waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact the local city office, the household waste disposal service or the shop where you purchased the product.

Chemical Substances

HP is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements such as REACH *(Regulation EC No 1907/2006 of the European Parliament and the Council)*. A chemical information report for this product can be found at: http://www.hp.com/go/reach

Restriction of Hazardous Substances (RoHS)

A Japanese regulatory requirement, defined by specification JIS C 0950, 2005, mandates that manufacturers provide Material Content Declarations for certain categories of electronic products offered for sale after July 1, 2006. To view the JIS C 0950 material declaration for this product, visit http://www.hp.com/go/jisc0950.

2005年、日本における製品含有表示方法、JISC0950が公示されました。製造事業者は、2006年7月1日以降に販売される電気・電子機器の特定化学物質の含有につきまして情報提供を義務付けられました。製品の部材表示につきましては、*http://www.hp.com/go/jisc0950*を参照してください。

有毒有害物质/元素的名称及含量表

根据中国
《电子信息产品污染控制管理办法》

液晶显示器

部件名称	有毒有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
液晶显示器显示面板	X	X	O	O	O	O
机箱/其它	X	O	O	O	O	O

CRT 显示器

部件名称	有毒有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
阴极射线管	X	O	O	O	O	O
机箱/其它	X	O	O	O	O	O

O：表示该有毒或有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。

X：表示该有毒或有害物质至少在该部件所用的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

表中标有“X”的所有部件都符合欧盟 RoHS 法规 — “欧洲议会和欧盟理事会 2003 年 1 月 27 日关于电子电器设备中限制使用某些有害物质的 2002/95/EC 号指令”。

注：环保使用期限的参考标识取决于产品正常工作的温度和湿度等条件。

E LCD Monitor Quality and Pixel Policy

The TFT monitor uses high-precision technology, manufactured according to HP standards, to guarantee trouble-free performance. Nevertheless, the display may have cosmetic imperfections that appear as small bright or dark spots. This is common to all LCD displays used in products supplied by all vendors and is not specific to the HP LCD. These imperfections are caused by one or more defective pixels or sub-pixels.

- A pixel consists of one red, one green, and one blue sub-pixel.
- A defective whole pixel is always turned on (a bright spot on a dark background), or it is always off (a dark spot on a bright background). The first is the more visible of the two.
- A defective sub-pixel (dot defect) is less visible than a defective whole pixel and is small and only visible on a specific background.

To locate defective pixels, the monitor should be viewed under normal operating conditions, in normal operating mode at a supported resolution and refresh rate, from a distance of approximately 50 cm (20 in).

HP expects that, over time, the industry will continue to improve its ability to produce LCDs with fewer cosmetic imperfections and HP will adjust guidelines as improvements are made.